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PLASTIC CLOSING CAP WITH SEALING RING

## TECHNICAL FIELD OF THE INVENTION

10 The present invention relates to a plastic closing cap for a container with an annular sealing ring.

## BACKGROUND OF THE INVENTION

15 Container closures moulded in one piece from a plastic material including downwardly depending seals are well known in the art. The purpose of these arrangements is to enable a cap to be easily screwed onto a container neck such that the edge of the container neck seals against the underside of the top plate of the cap, while the sealing ring is pressed  
20 into firm sealing engagement with the edge of the container neck.

In the case of containers made of plastics material it can certainly happen that the edge of the container neck has  
25 suffered minor damage, deformation and/or irregularities caused during the manufacturing procedure, and which are sufficient to have a negative effect on the sealing engagement between the edge of the container neck and sealing elements of the cap.  
30 Thus, a deteriorated seal in the case of bottles for carbonated drinks can have the result that gas escapes from the bottle and after a few days of storage the drink has lost its carbon dioxide and is tasteless.

35 The known closures therefore still do not guarantee absolutely sealing integrity in the event of minor damage or deformation of the edge of the container neck.

40 In addition, caps when applied to plastic containers for sterilized beverage e.g. milk or dairy products, must also meet rigid requirements to prevent contamination and the overall cap structure must be leak-proof. In order to provide a liquid-tight seal it is, therefore, known to use either a sealing laminated membrane on the opening of the  
45 container or a separate liner inside of the cap.

However, these arrangements are characterized by higher manufacturing and/or recycling costs while cannot guarantee  
50 reliable sealing integrity.

## SUMMARY OF THE INVENTION

5 It is, therefore, an object of the present invention to provide an improved plastic closing cap, which overcomes the deficiencies of the prior art and ensures reliably the sealing function and prevents leaks in the event of minor  
10 damage or deformation of the container neck.

A further aspect of the present invention is to provide a closing cap particular useful for sterilized products such as milk or dairy products which provides easy opening and  
15 reclosing of the container and effectively sealing prior to and after reclosing.

In accordance with the above objects of the present invention, a closing cap moulded in one piece from a  
20 plastics material for sealing a container with a threaded neck is provided comprising a top plate which is substantially in the form of a circular disc, a substantially cylindrical peripheral portion extending downwardly from said top plate, said peripheral portion having an internal  
25 screw thread adapted to cooperate with the threaded container neck, an integrally moulded deformable sealing ring extending downwardly from an inner surface of said top plate and spaced radially inward of the substantially cylindrical peripheral portion, wherein when said closing  
30 cap is applied onto the threaded container neck, said sealing ring is adapted to radially deform outwardly and seal at least substantially along the outer surface of the container neck by virtue of the elastic return forces without being clamped between the container neck and the  
35 substantially cylindrical peripheral portion and without being pressed against the substantially cylindrical peripheral portion.

Further preferred embodiments of the present invention are  
40 defined in dependent claims 2 to 17.

The closing cap of the invention is ergonomic by offering compactness, and it adapts very easily to any container necks.  
45 In the closed position it ensures perfect sealing. The cap is also able to retain a liquid-tight seal after a period of time due to its configuration in conjunction with its material's characteristics. Operations of assembling the cap together on the neck of the  
50 container is quick and very easy.

Other objects and advantages of the present invention will  
5 become apparent to those skilled in the art in view of the  
following detailed description taken in conjunction with the  
accompanying drawings, wherein like reference numbers refer  
to similar parts throughout the drawings, and wherein:

10 BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1A and 1B show a perspective view, partially broken  
away, of a closing cap according to the present invention  
applied to the container prior to, and after formation of a  
15 seal;

Figs. 2A and 2B show a perspective view, partially broken  
away, of a second alternative closing cap according to the  
present invention applied to the container prior to, and  
20 after formation of a seal;

Figs. 3A and 3B show a perspective view, partially broken  
away, of a third alternative closing cap according to the  
present invention applied to the container prior to, and  
25 after formation of a seal;

Figs. 4A and 4B show a perspective view, partially broken  
away, of another alternative closing cap according to the  
present invention applied to the container prior to, and  
30 after formation of a seal;

Figs. 5A and 5B show a partial cross-sectional view of an  
alternative closing cap according to the present invention  
in place on a container prior to, and after removal of the  
35 laminated disc; and

Fig. 6A and 6B show a partial cross-sectional view of a  
further alternative closing cap according to the present  
invention in place on a container prior to, and after  
40 removal of the laminated disc.

DETAILED DESCRIPTION OF THE INVENTION

Referring first to Figure 5A of the drawings, the closing  
45 cap 1 is moulded in one piece from a resilient plastics  
material and has a top plate 3 in the shape of a circular  
disc and an annular skirt 4 peripherally downwardly  
depending therefrom. The annular skirt 4 has an internal  
screw thread 5. On the inner surface of the top plate 3  
50 extending downwardly there is an integrally moulded thin,

5 deformable annular sealing ring 6 of uniform thickness which  
is of substantially cylindrical construction. In addition,  
the sealing ring 6 is disposed at a position spaced radially  
inwardly of the annular skirt 4, and concentric with said  
annular skirt. Said sealing ring 6 has a length such as to  
10 permit its portion adjoining its free edge to extend along  
the upper outer surface of the container neck 2. The sealing  
ring 6 is made of the same plastic material as the cap 1 and  
preferably has a thickness of equal or less than 0.8mm.

15 A container has an annular neck 2 with an external thread  
formed thereon.

In accordance with one aspect of the present invention the  
closing cap is adapted for use with a container, which is a  
thin-walled light weight blow-molded plastic bottle (e.g.  
for milk or dairy products) provided with an externally  
20 screw-threaded neck 2. The container neck 2 has above its  
threads an upwardly and inwardly directed portion 8 which is  
tapered (e.g. frusto-conically) and may have a substantially  
radially inwardly directed rim 9 for engagement with a stop  
means 7 of the closing cap referred to below.

25 In use, as depicted in Figs.1A and 1B, the closing cap 1 is  
applied to the container neck 2 so that the top of the  
container neck moves upwardly as in Figure 1A to adopt the  
position shown in Figure 1B.

30 As it does so the sealing ring 6 first comes into contact  
with the outer surface of the container neck 2 while the  
closing cap 1 is being rotated during the capping operation.  
Further rotation of the closing cap 1 relative to the  
container neck 2 causes the container neck 2 to move  
35 upwardly relative to the closing cap 2 to adopt the position  
shown in Figure 1B.

On the inner surface of the top plate, the sealing ring 6 is  
disposed at a radius approximately equal to the radial  
distance of the middle of the tapered portion 8 of the  
40 container neck 2. Therefore, during the capping operation  
the sealing ring 6 is being urged away by the tapered  
portion 8 of the container neck 2 and thus it is deformed  
radially outwardly, and lies against the outer surface of  
the tapered portion 8 of the container neck, and has a  
45 sufficient length in contact with it.

Hence, the sealing ring 6 is fully conformed to the outer  
surface of the container neck 2 by virtue of its elasticity  
without being clamped between the container neck 2 and the  
annular skirt 4 and without being pressed against the skirt  
50 4.

5 In this condition an effective tight seal is formed between  
the outer surface of the tapered portion 8 of the container  
neck 2 and the inner surface of the sealing ring 6.  
Moreover, due to the elastic return forces which occur in  
that case and the deformation of the sealing ring 6 in  
conjunction with the resilience of the plastics material,  
10 said seal is maintained despite relaxation.

At the same time, because of this radial displacement of the  
sealing ring 6, there is a pivotal force applied to the  
15 inner surface of the top plate 3 which tends to resist  
doming in conjunction with the stop means 7 of the cap  
referred to below.

Referring now to Figures 2A and 2B of the drawings, another  
20 modification of the present invention is shown in which the  
sealing ring is L-shaped and sealing integrity is afforded  
by virtue of engagement of the short side of the L-shaped  
sealing ring, which is parallel to the top plate of the cap,  
with the upper portion (tapered portion) of the container  
25 neck, wherein said short side is displaced inwardly and is  
then clamped between the outside surface of the container  
neck and the long side of the L-shaped sealing ring.

30 Figs. 3A and 3B show another modification of the invention  
in which the sealing ring is attached to the annular skirt  
above its internal threads and is substantially parallel to  
the top plate of the cap.

35 Figures 4A and 4B show a further modification of the present  
invention in which the sealing ring is attached to the inner  
surface of the top plate of the cap at a position spaced  
radially inwardly of the annular skirt and extends  
downwardly and inwardly (conical) from the top plate of the  
40 cap.

Arrangements of the foregoing type are used with a further  
main feature of the invention shown in Figures 1 to 6, i.e.  
the stop means 7.

45 Figs. 5A and 5B show an alternative modification for use in  
cases where there is a laminated disc 10 sealed on the  
container opening.  
The laminated disc is attached to and sealed on the  
containers by means of a plastic heat shrinkable tube which  
50 insures a tight sealing engagement about the container  
opening. This arrangement offers many advantages, e.g. high

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shapping nature and high-temp resistance, tight sealing and  
5 better fineness.

The stop means 7 is a shallow ring which extends downwardly  
from the inner surface of the top plate 3. It is disposed  
radially inwardly of the sealing ring 6, and has an external  
10 diameter which is slightly smaller than the inner diameter  
of the inwardly directed rim 9 of the container neck 2,  
namely slightly smaller than the container opening.  
The stop means is further provided with a tapering conical  
tip.

15 As shown in Fig.5A, during the capping procedure, the  
laminated disc 10 at the region of the rim portion 9 of the  
container neck 2 comes into contact with the tapering tip of  
the stop means 7 which has the effect of limiting the  
20 upwardly movement of the container neck 2. In this condition  
the closing cap 1 is screwed onto the container neck 2, the  
sealing ring 6 is not deformed and a liduid-tight seal is  
provided by the laminated disc 10.

25 Once the container has been opened and the laminated disc 10  
has been removed, the reclosing of the container is achieved  
in that the closing cap 1 is further rotated, and due to the  
relative movement between the container neck 2 and the cap  
1, the stop means 7 adopts the position shown in Figure 5B.  
30 Only just during this reclosing procedure the sealing ring 6  
comes into contact with the tapered portion 8 of the  
container neck 2 and is thereby deformed.

Because the stop means 7 is intended essentially and  
35 primarily as a restriction and secondly as a seal, the main  
sealing effect also in this modification is to be found  
between the outer surface of the tapered portion 8 of the  
container neck 2 and the inner surface of the sealing ring  
6.

40 Further, because the stop means 7 is disposed in-board of  
the sealing ring 6, it tends to strengthen the central  
portion of the top plate 3. This resists doming.

45 It will thus be seen that during reclosing of the cap 1 to  
the container neck 2, the outer surface of the tapered  
portion 8 of the container neck 2 first comes into contact  
with the sealing ring 6 thereby causing effective sealing.

50 It will also be appreciated that by virtue of the relative  
thickness of the flexible sealing ring 6 taken with the

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- effects of the stop means 7, a more effective seal is provided than previously.
- 5 The stop means 7 and the stiffness of the top plate 3 together result in that the effects of doming upon the sealing ring 6 are reduced thus ensuring that the sealing ring 6 does not get pulled out of sealing engagement with the container neck 2.
- 10 Further, the stop means 7 acts as a stiffening rib and may be continuous or discontinuous.
- The arrangement shown in Figures 6A and 6B is similar to that in Figures 5A and 5B, but in Figs. 6A and 6B the stop means 7 is an annular disc depending from the inner surface of the top plate 3 of the cap and is generally trapezoidal in cross section, decreasing in a direction downwardly and away from the the top plate.
- 15 20 The inventive closing caps are preferably made by injection moulding of polypropylene or high density polyethylene plastics materials.
- 25 The stop means is intended to have sealing properties but needs to be used in conjunction with a primary seal for example as hereinbefore set forth.
- The closing cap is designed to be fitted onto a glass or plastic container, such as a soft drink bottle.
- 30 It should be noted that the container can hold various liquids including, but not limited to, dairy products, a carbonated beverage, a non-carbonated liquid or a vaporized product.
- 35 Closures of this type may be produced, preferably by injection moulding, with or without tamper evident band. Preferably the skirt terminates in a plurality of frangible bridges supporting a tamper evident band for cooperation with a plain security band on the outer neck portion of the container neck in the usual way.
- 40 The skirt is preferably provided with external knurling or vertical ribbing to improve manual grip.
- 45 The thickness of the sealing ring may be preferably more than 0.80mm.
- While preferred embodiments have been shown and described obviously minor modifications in design and construction can be effected in the invention without departing from the spirit and scope thereof, as defined in the appended claims.
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